

Name: ANSWER KEY

Date: _____

Ch 7 Test Real and Complex Numbers

Multiply and simplify each Real radical expression.

$$1. (7-4\sqrt{3})(7-4\sqrt{3})$$

$$(A-B)^2$$

$$A^2 - 2AB + B^2$$

$$(7-4\sqrt{3})^2$$

$$49 - 56\sqrt{3} + 4 \cdot 3$$

$$\boxed{61 - 56\sqrt{3}}$$

$$2. (8+\sqrt{6})(-4-\sqrt{6})$$

$$-32 - 8\sqrt{6} - 4\sqrt{6} - 6$$

$$\boxed{-38 - 12\sqrt{6}}$$

Rationalize the denominator

$$3. \frac{7}{4+\sqrt{3}} \cdot \frac{(4-\sqrt{3})}{(4-\sqrt{3})}$$

$$\frac{28-7\sqrt{3}}{16-3} = \boxed{\frac{28-7\sqrt{3}}{13}}$$

$$4. \frac{\sqrt{5}+3}{2+\sqrt{5}} \cdot \frac{(2-\sqrt{5})}{(2-\sqrt{5})} = \frac{2\sqrt{5}-5+6-3\sqrt{5}}{4-5}$$

$$\frac{-\sqrt{5}+1}{-1} = \boxed{\sqrt{5}-1}$$

Simplify each real number.

$$5. \sqrt{(75x^3y^4)} \Rightarrow \sqrt{25 \cdot 3x^3y^4}$$

$$\boxed{5xy^2\sqrt{3x}}$$

$$6. \frac{\sqrt[3]{500x^7y^{-3}}}{\sqrt[3]{2z^2}} = \sqrt[3]{\frac{500x^7y^{-3}}{2z^2}} = \sqrt[3]{\frac{250x^7}{y^3z^2}}$$

$$\frac{\sqrt[3]{250x^7}}{\sqrt[3]{y^3z^2}} \Rightarrow \frac{5x^2\sqrt[3]{2x}}{y\sqrt[3]{z^2}} \cdot \frac{\sqrt[3]{z}}{\sqrt[3]{z}}$$

$$\boxed{\frac{5x^2\sqrt[3]{2xz}}{yz}}$$

Write without a rational exponent.

$$7. (8xy)^{\frac{2}{3}}$$

$$\sqrt[3]{8^2x^2y^2}$$

$$\sqrt[3]{64x^2y^2}$$

$$\boxed{4\sqrt[3]{x^2y^2}}$$

Write in simplest Radical Form

$$8. \sqrt[4]{16y^{10}} \Rightarrow \boxed{2y^2\sqrt[4]{y^2}}$$

Solve

$$9. \sqrt{y+1} - 5 = 8$$

$$+5 \quad +5$$

$$(\sqrt{y+1})^2 = (13)^2$$

$$y+1 = 169$$

$$\boxed{y = 168}$$

$$10. 4 + \sqrt{10-x} = 6 + \sqrt{4-x}$$

$$-4 \quad -4$$

$$(\sqrt{10-x})^2 = (2 + \sqrt{4-x})^2$$

$$10-x = 4 + 4\sqrt{4-x} + 4-x$$

$$+x$$

$$+x$$

$$10 = 8 + 4\sqrt{4-x}$$

$$2 = 4\sqrt{4-x}$$

$$\left(\frac{1}{2}\right)^2 = (\sqrt{4-x})^2 \quad \rightarrow \quad -3\frac{3}{4} = -x$$

$$\frac{1}{4} = 4-x$$

$$-4 \quad -4$$

$$\boxed{3\frac{3}{4} = x}$$

$$11. (3+i)x + i = 5i$$

$$(3+i)x = 4i$$

$$x = \frac{4i}{3+i} \cdot \frac{(3-i)}{(3-i)}$$

$$x = \frac{12i - 4i^2}{9+1}$$

$$x = \frac{12i + 4}{10}$$

$$\boxed{x = \frac{6}{5}i + \frac{2}{5}}$$

$$12. (1+2i)x + 3 - 2i = 4 - 5i + 3ix$$

$$-3 + 2i \quad -3 + 2i$$

$$(1+2i)x = 1 - 3i + (3i)x$$

$$-(3i)x$$

Factor out
the x.

$$x(1+2i-(3i)) = 1-3i$$

$$\frac{x(1-i)}{1-i} = \frac{1-3i}{1-i}$$

$$x = \frac{1-3i}{1-i} \cdot \frac{(1+i)}{(1+i)}$$

$$x = \frac{1-3i+i-3i^2}{1-i^2}$$

$$x = \frac{1-2i+3}{1+1}$$

$$x = \frac{4-2i}{2}$$

$$\boxed{x = 2-i}$$

Express each number in terms of i .

13. $\sqrt{-64x^3} \Rightarrow \sqrt{64i^2x^3}$

$\boxed{8ix\sqrt{x}}$

14. $-\sqrt{-147}$

$-i\sqrt{147} \Rightarrow -i\sqrt{3 \cdot 49}$
 $\Rightarrow \boxed{-7i\sqrt{3}}$

Multiply.

15. $\sqrt{-6}\sqrt{-8}$

$i\sqrt{6} \cdot i\sqrt{8}$

$i^2\sqrt{3 \cdot 2 \cdot 4 \cdot 2}$

$i^2\sqrt{4^2 \cdot 3}$

$\boxed{-4\sqrt{3}}$

Add or Subtract.

17. $6i + (-3i) + 5$

$3i + 5$

or

$5 + 3i$

16. $-\sqrt{-5}(-\sqrt{-5})$

$(-i\sqrt{5})(-i\sqrt{5})$

$(-i\sqrt{5})(-i\sqrt{5})$

$i^2 \cdot (5)$

$\boxed{-5}$

18. $(8-6i) - (-14+2i)$

$8-6i+14-2i$

$\boxed{22-8i}$

Simplify.

19. $i^{15} + i^{32} - 2i^{72}$

\downarrow
 $i^3 + 1 - 2$

\downarrow
 $-i - 1$

$\boxed{-1-i}$

Calculate.

21. $|-4+5i|$

$\sqrt{(-4)^2 + (5)^2}$

$\sqrt{16+25}$

$\boxed{\sqrt{41}}$

Solve for x and y .

22. $12x + yi = 16 - i$

$\frac{12x}{12} = \frac{16}{12}$

$\boxed{x = \frac{4}{3}}$

$\frac{yi}{i} = \frac{-i}{i}$

$\boxed{y = -1}$

Multiply or Divide

23. $(4+i)(7-3i)$

$$7(4+i) - 3i(4+i)$$

$$28 + 7i - 12i - 3i^2$$

$$28 - 5i + 3$$

$$\boxed{31 - 5i}$$

24. $(1+i\sqrt{3})(6-3i\sqrt{3})$

$$6(1+i\sqrt{3}) - 3i\sqrt{3}(1+i\sqrt{3})$$

$$6 + 6i\sqrt{3} - 3i\sqrt{3} - 3i^2(3)$$

$$6 + 3i\sqrt{3} + 9$$

$$\boxed{15 + 3i\sqrt{3}}$$

25. $\frac{i-\sqrt{5}}{\sqrt{5}+2i} \cdot \frac{(\sqrt{5}-2i)}{(\sqrt{5}-2i)}$

$$= \frac{i(\sqrt{5}-2i) - \sqrt{5}(\sqrt{5}-2i)}{5 - 4i^2}$$

$$= \frac{i\sqrt{5} - 2i^2 - 5 + 2i\sqrt{5}}{9}$$

$$= \frac{3i\sqrt{5} - 3}{9}$$

$$= \boxed{\frac{i\sqrt{5} - 1}{3}}$$